**Teenage Drivers**

An insurance company completed a study that resulted with the following information about drivers aged 16 to 18 years: out of 140 students, 20% were involved in accidents each year; 10% in this age group are honor students; among those involved in an accident, 7% are honor students.

**Part I: Setup**

1. Use the given information to construct a two-way frequency table (also known as a contingency table).
2. Why is it necessary to round the frequency in cell Accident AND A Student to the nearest integer?
3. What is the complement event of being an honor student AND having an accident?
4. Generalize how to find the proportion of a simple event in a two-way table. (Ex: Students having an accident, Students Not being honor students)

1. Generalize how to find the proportion of an intersection of two events in a two-way table? (Ex: the students has an accident AND is an honor student)

1. Generalize how to find the proportion of the union of two events in a two-way table? (Ex: the students is an honor student OR the student has an accident, the student is an honor student OR not an honor student)

**Part II: Conclusions**

1. What proportion of students did not have an accident? Show the fraction and percentage.
2. What proportion of students are not honor students?
3. What proportion of students are an honor student AND did not have an accident?
4. Find the proportion of the complement from #10 above.
5. Find the proportion of students who were in an Accident OR not in an accident.
6. Find the proportion of students who were not an honor students OR not in an accident?
7. Find the proportion of students who were not an honor student OR in an accident?
8. Write a conclusion using the proportions above.

**Teenage Drivers (Solution)**

An insurance company completed a study that resulted with the following information about drivers aged 16 to 18 years: out of 140 students, 20% were involved in accidents each year; 10% in this age group are honor students; among those involved in an accident, 7% are honor students.

**Part I: Setup**

1. Use the given information to construct a two-way frequency table (also known as a contingency table.)

Teacher will need to decide if you will only accept the first one or if you will accept either.

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Accident** | **No Accident** | **Total** |
| **Honor student** | 2 | 12 | 14 |
| **Not an honor student** | 26 | 100 | 126 |
| **Total** | 28 | 112 | 140 |

OR

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Honor Student** | **Not an honor student** | **Total** |
| **Accident** | 2 | 26 | 28 |
| **No Accident** | 12 | 100 | 112 |
| **Total** | 14 | 126 | 140 |

1. Why is it necessary to round the frequency in cell Accident AND A Student to the nearest integer?

Seven percent of 28 is 1.96. You cannot have 1.96th of a student. You round to the nearest integer.

1. What is the complement event of being an honor student AND having an accident? Describe the complement in context.

NOT being an honor student AND NOT having an accident.

Being a good driver (no accident) even if not an Honors student.

1. Generalize how to find the proportion of a simple event in a two-way table? (Ex: Students having an accident, Students Not being honor students)

The proportion of a simple event is found by dividing the event’s total either located in a row or column by the sample size (the right, bottom cell). (A column or row total is called a marginal total.)

1. Generalize how to find the proportion of an intersection of two events in a two-way table? (Ex: the students has an accident AND is an honor student)

The proportion of an intersection of two events is found by locating the intersection of the two events, which is located in the body of the table, not one of the totals. After the intersection is located, divide that by the total sample size.

1. Generalize how to find the proportion of the union of two events in a two-way table? (Ex: the students is an honor student OR the student has an accident, the student is an honor student OR not an honor student)

The proportion of the union of two events is found by adding the two event’s totals either two rows, two columns, or one row with one column. After adding the two totals, you must subtract the intersection if the two events are not disjoint, or mutually exclusive. Lastly, that answer is divided by the total sample size.

**Part II: Conclusions**

1. What proportion of students did not have an accident? Show the fraction and percentage.

= 0.8, 80%

1. What proportion of students are not honor students?

= 0.9, 90%

1. What proportion of students are an honor student AND did not have an accident?

= 0.086, 8.6%

1. Find the proportion of the complement of students who are honors students and did not have an accident.

= 0.186, 18.6%

1. Find the proportion of students who were in an Accident OR not in an accident.

= 1, 100%

1. Find the proportion of students who were not honor students OR not in an accident.

= 0.986, 98.6%

1. Find the proportion of students who were not an honor student OR in an accident?.

= 0.914, 91.4%

1. You have been asked to make a recommendation to the insurance company about whether it should vary insurance rates based on the academic record of the driver. Using the data from the table and your proportions, write a convincing memo to the company about what they should do.

Answers will vary:

Only 8.6% of the students were honor students and did not have an accident, whereas 18.6% of the students were not honor students and did have an accident. Also, 93% of the students who had an accident were NOT an honor student. Therefore, I recommend the insurance rates be lowered for students who are honor students because they are less likely to have an accident.